

## WHAT IS CLAIMED IS:

1. An optical wavelength converter for converting input phase-modulated light having a first wavelength to output phase-modulated light having a second wavelength, the wavelength converter comprising:

5        an input-light splitter adapted to split the input phase-modulated light into first split light and second split light;

      a multiplex-interference portion adapted to multiplex-interfering the first split light and the second split light to generate intensity-modulated light having the first wavelength; and

10       a phase modulation portion which, upon receipt of the intensity-modulated light and continuous wave light having a wavelength equal to the second wavelength, performs cross-phase modulation of the continuous wave light in accordance with the phase modulation of the input phase-modulated light.

15       2. The optical wavelength converter according to claim 1, wherein the multiplex-interference portion includes: an injection synchronization laser diode which generates continuous wave light having a wavelength equal to the first wavelength upon input of the first split light; and a  
20       multiplex optical coupler which multiplexes the continuous wave light having the first wavelength generated by the injection synchronization laser diode and the second split light outputted from the input-light splitter.

25       3. The optical wavelength converter according to claim 1, wherein

the multiplex-interference portion includes a delay portion for delaying one of the first split light and the second split light by one-bit delay time from the other in performing the interference.

5           4. The optical wavelength converter according to claim 2, wherein the phase modulation portion comprises a semiconductor optical amplifier having a cross-phase modulation effect.

10           5. The optical wavelength converter according to claim 3, wherein the phase modulation portion comprises a semiconductor optical amplifier having a cross-phase modulation effect.

15           6. The optical wavelength converter according to claim 2, wherein the phase modulation portion comprises an optical modulator of an electro-absorption type having a cross-phase modulation effect.

20           7. The optical wavelength converter according to claim 3, wherein the phase modulation portion comprises an optical modulator of an electro-absorption type having a cross-phase modulation effect.

            8. The optical wavelength converter according to claim 2, wherein the phase modulation portion comprises a plurality of phase modulators connected in series, said plurality of phase modulators including:

25           a first phase modulator that performs the cross-phase modulation between the intensity-modulated light having the first wavelength

generated by the multiplex-interference portion and the continuous wave light having the second wavelength, and

5 a second phase modulator that performs cross-phase modulation between subsequent-stage intensity-modulated light and subsequent-stage phase-modulated light having the second wavelength generated by the first phase modulator.

10 9. The optical wavelength converter according to claim 3, wherein the phase modulation portion comprises a plurality of phase modulators connected in series, said plurality of phase modulators including:

a first phase modulator that performs the cross-phase modulation between the intensity-modulated light having the first wavelength generated by the multiplex-interference portion and the continuous wave light having the second wavelength, and

15 a second phase modulator that performs cross-phase modulation between subsequent-stage intensity-modulated light and subsequent-stage phase-modulated light having the second wavelength generated by the first phase modulator.

20 10. The optical wavelength converter according to claim 1, wherein the multiplex-interference portion includes a delay portion for delaying one of the first split light and the second split light by a delay time shorter than a one-bit time from the other one of the first split light and the second split light in performing the multiplex-interference of the first  
25 split light and the second split light to generate an optical pulse.

11. The optical wavelength converter according to claim 10, further comprising an optical bistable device which generates an intensity-modulated light having the first wavelength with an optical-power intensity varied in response to input of the optical pulse generated by the  
5 multiplex-interference portion, wherein the intensity-modulated light generated by the optical bistable device and the continuous wave light having the second wavelength are inputted to the phase modulation portion to output the phase-modulated light having the second  
10 wavelength.